

What is claimed is:

1. A damped micromechanical device comprising a housing provided with an internal fluid-tight chamber, an electrically-driven microactuator disposed in the fluid-tight chamber and having a movable structure capable of being moved between first and second positions at a resonant frequency and a damping fluid disposed in the fluid-tight chamber for  
5 damping the movement of the movable structure at the resonant frequency.

2. The device of Claim 1 wherein the damping fluid has a viscosity greater than the viscosity of air.

3. The device of Claim 1 wherein the damping fluid is a liquid selected from the group consisting of polar liquids and nonpolar liquids.

4. The device of Claim 3 wherein the liquid is a dielectric liquid.

5. The device of Claim 1 wherein the damping fluid is a super-critical fluid.

6. The device of Claim 1 wherein the microactuator is an electromagnetic microactuator.

7. The device of Claim 6 wherein the microactuator is an electrostatic microactuator.

8. The device of Claim 7 wherein the microactuator includes a substrate, at least one comb drive assembly having a first comb drive member mounted on the substrate and a second comb drive member overlying the substrate, at least one spring member having a first end portion coupled to the substrate and a second end portion coupled to the movable structure, the movable  
5 structure including the second comb drive member and the second comb drive member being movable at the resonant frequency between first and second positions relative to the first comb drive member.

9. The device of Claim 8 wherein the first comb drive member has a plurality of first comb drive fingers and the second comb drive member has a plurality of second comb drive fingers, the second comb drive fingers being not substantially fully interdigitated with the first comb drive fingers when the second comb drive member is in the first position and the second comb drive fingers being substantially fully interdigitated with the first comb drive fingers when the second comb drive member is in the second position.

10. The device of Claim 8 wherein the damping fluid has a dielectric constant greater than the dielectric constant of air so as to enhance the electrostatic forces between the first and second comb drive members.

11. The device of Claim 8 further comprising at least one drag-inducing member carried by the movable structure for producing drag on the movable structure as it moves between its first and second positions.

12. The device of Claim 11 wherein the at least one drag-inducing member is a fin.

13. The device of Claim 1 further comprising at least one drag-inducing member carried by the movable structure for producing drag on the movable structure as it moves between its first and second positions.

14. The device of Claim 1 wherein the microactuator has a mechanical quality factor  $Q$  that ranges from 0.3 to 20 when operated in the damping fluid.

15. The device of Claim 14 wherein the microactuator has a mechanical quality factor  $Q$  that ranges from 0.5 to 3 when operated in the damping fluid.

16. A damped micromechanical device comprising a housing provided with an internal fluid-tight chamber, an electrostatic microactuator disposed in the fluid-tight chamber and having a stationary structure and a movable structure capable of being moved between first and second positions at a resonant frequency relative to the stationary structure and a dielectric

5 liquid disposed in the fluid-tight chamber for damping the movement of the movable structure at the resonant frequency and enhancing the electrostatic force between the stationary structure and the movable structure.

17. The device of Claim 16 wherein the microactuator includes a substrate, at least one comb drive assembly having a first comb drive member mounted on the substrate and a second comb drive member overlying the substrate, at least one spring member having a first end portion coupled to the substrate and a second end portion coupled to the movable structure, the  
5 movable structure including the second comb drive member and the second comb drive member being movable at the resonant frequency between first and second positions relative to the first comb drive member.

18. The device of Claim 17 wherein the first comb drive member has a plurality of first comb drive fingers and the second comb drive member has a plurality of second comb drive fingers, the second comb drive fingers being not substantially fully interdigitated with the first comb drive fingers when the second comb drive member is in the first position and the second  
5 comb drive fingers being substantially fully interdigitated with the first comb drive fingers when the second comb drive member is in the second position.

19. The device of Claim 16 wherein the liquid is selected from the group consisting of a polar liquid and a nonpolar liquid.